

## [Phrozen Resin User Guide]

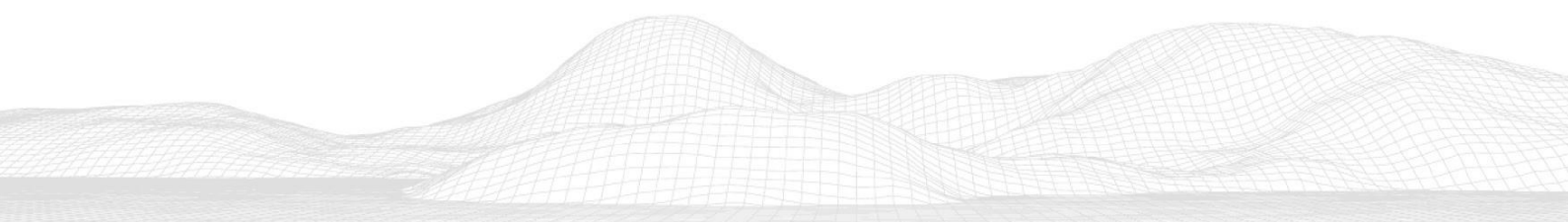
# Phrozen Study Dental Model

### Outline

Before printing the perfect object, it is important to first understand the material limitations we are handling and how it can be successfully printed under various conditions. With this in mind, Phrozen provides the following design suggestions to help you better understand the properties of each material and how you can best utilize them to bring your wildest creation to life.

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## Section 1

# TDS

Mechanical Properties*	Unit	Results	Method
Tensile Stress at Break	MPa	28	ASTM D638
Young's Modulus	MPa	920	ASTM D638
Elongation at Break	%	7	ASTM D638
Izod Impact Strength (Notched)	J/m	24	ASTM D256
Shore D Hardness	-	90	ASTM 2240
Solid Density	g/cm <sup>3</sup>	1.4	ASTM D1475
<b>Liquid Properties</b>			
Viscosity at 25°C (77°F)	cP	150 - 230	ASTM D1475
Liquid Density	g/cm <sup>3</sup>	1.13	ASTM D7867

*\* All testing specimens are printed using Phrozen Sonic 4K 2022 or Sonic XL 4K 2022, and post-cured using Phrozen Cure Mega.*

## Section 2

# Printing

### Printing Parameters

<b>Printer</b>	Sonic 4K 2022
<b>Layer Height</b>	50μm
<b>Exposure Time</b>	2.5~3.5 s
<b>Bottom Exposure time</b>	20~30 s
<b>Light-off Delay</b>	1~3 s
<b>Lift Distance</b>	7 mm
<b>Lifting Speed</b>	50 mm/min

<b>Printer</b>	Sonic 4K XL 2022
<b>Layer Height</b>	50μm
<b>Exposure Time</b>	1.5~2.5 s
<b>Bottom Exposure time</b>	20~30 s
<b>Light-off Delay</b>	1~3s
<b>Lift Distance</b>	7 mm
<b>Lifting Speed</b>	50 mm/min

## Printing Suggestions

### Printing

Shake well the resin before pouring it to the vat.

### Printing Full-Plate

When printing full-plate prints, it's recommended to add 1-2 seconds of light-off delay.

### Printing Hollow Objects

Since hollow models are already mostly cured even prior to post-curing, make sure the model wall thickness is not less than the recommended minimum to avoid over-curing and causing damage when removing the model.

## Cleaning

After removing the printed object from the building stage, use an ultrasonic cleaner and 95% alcohol for 120 seconds to remove uncured resin from the surface. Make sure that the object has been thoroughly cleaned, then leave it in a dark place for up to 30 minutes or use an air gun to immediately dry the printed object.

## Post-Curing

Use Phrozen post-curing lamps (Cure V2, Cure Luna, Cure Mega) or other post-curing lamps with the same wavelength to cure printed objects. Cure for 1 minute to achieve good mechanical properties and precision. If the printed object turns yellow after secondary curing, use an oven to bake the object at 80°C for 20 minutes to remove the yellow hue.

## Section 3

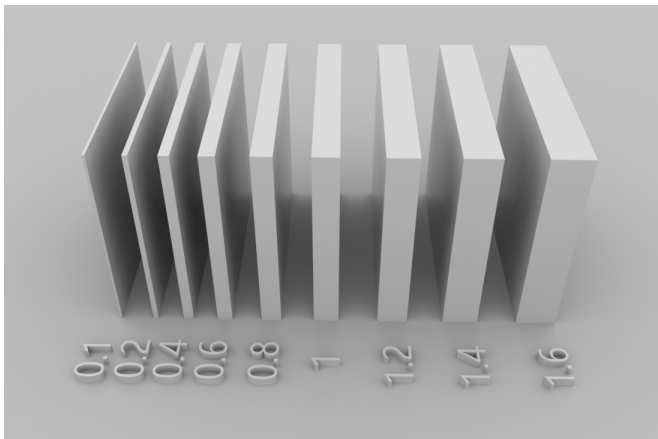
# Design Specifications

※**Note: All indicators are limited to each resin; the value will vary with different machines and environmental conditions.**※

### Minimum Unsupported Wall Thickness

This indicator shows the minimum wall thickness that can be printed independently with no support without causing any bending or breaking.

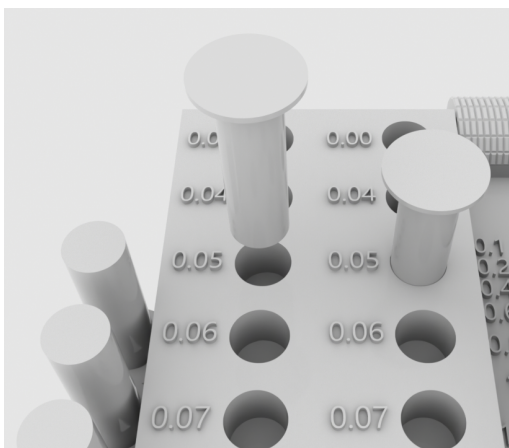
*Recommended thickness:*  $\geq 3$  mm



### Size Tolerance, X-Y plane

This indicator shows the minimum dimensional tolerance between the hole and the column parallel to the XY plane.

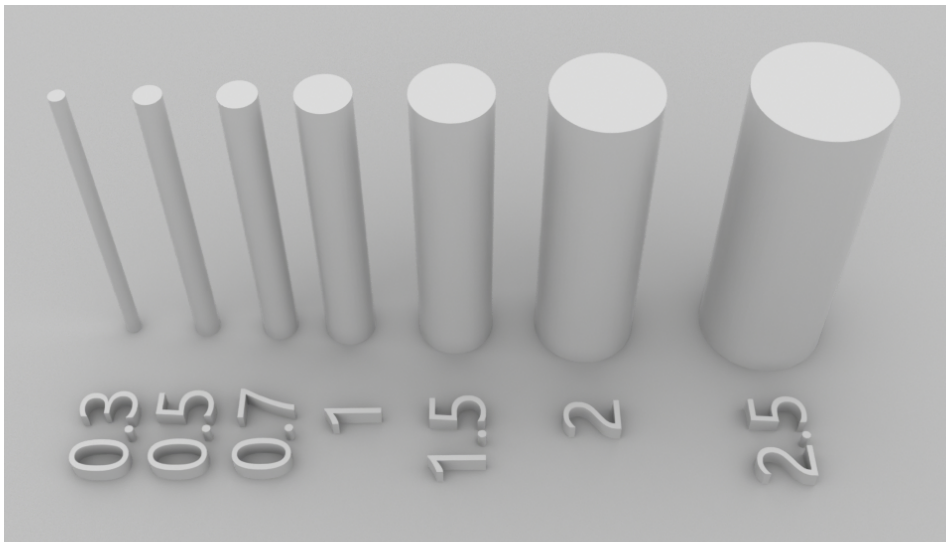
*Recommended tolerance:*  $\geq 0.06$  mm



### Minimum Pin Diameter

This indicator shows the minimum column diameter of pillars and supports that can be printed independently without bending or breaking.

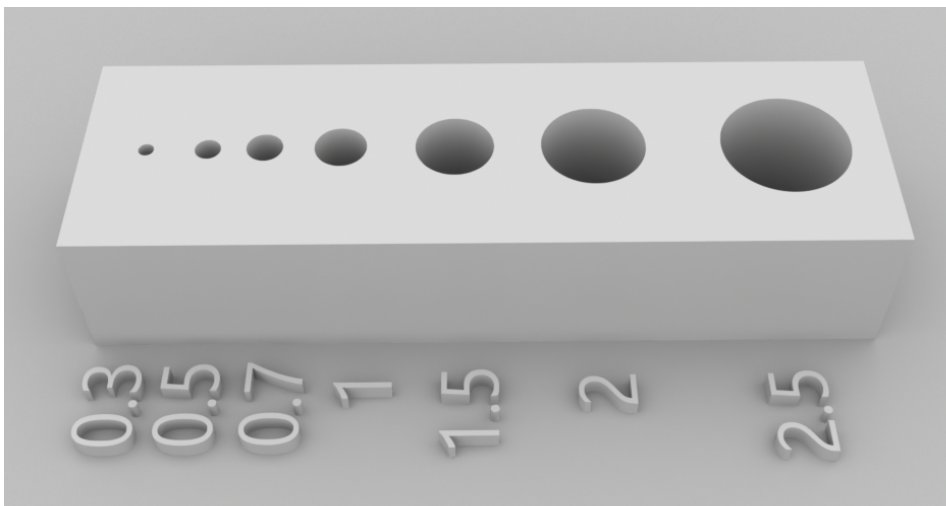
*Recommended diameter:  $\geq 0.5$  mm*



### Minimum Hole Diameter, X-Y plane

This indicator shows the minimum hole diameter that can be successfully printed parallel to the XY plane.

*Recommended diameter:  $\geq 0.7$  mm*



### Minimum Embossed Detail Width, X-Y plane

This indicator shows the minimum line width that can successfully be printed with embossed details.

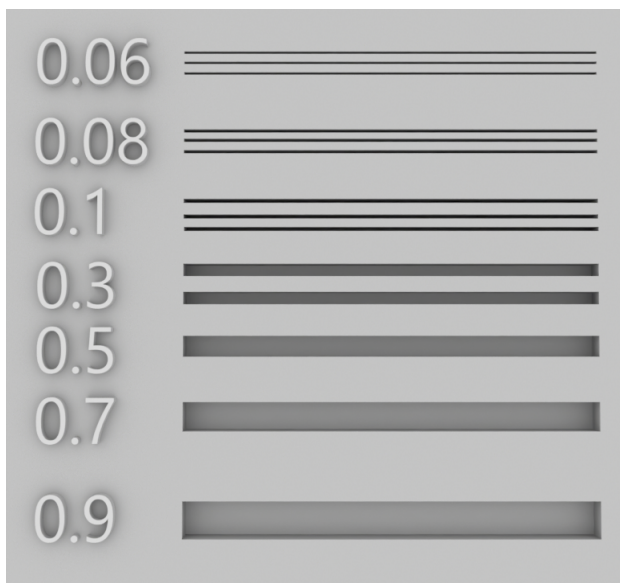
*Recommended width:*  $\geq 0.08$  mm



### Minimum Engraved Detail Width, X-Y plane

This indicator shows the minimum line width that can successfully be printed with engraved details.

*Recommended width:*  $\geq 0.06$  mm



## Maximum Horizontal Bridge Span

This indicator shows the maximum width between the supporting walls that can be printed without deforming the bridge.

*Recommended width:*  $\leq 6$  mm

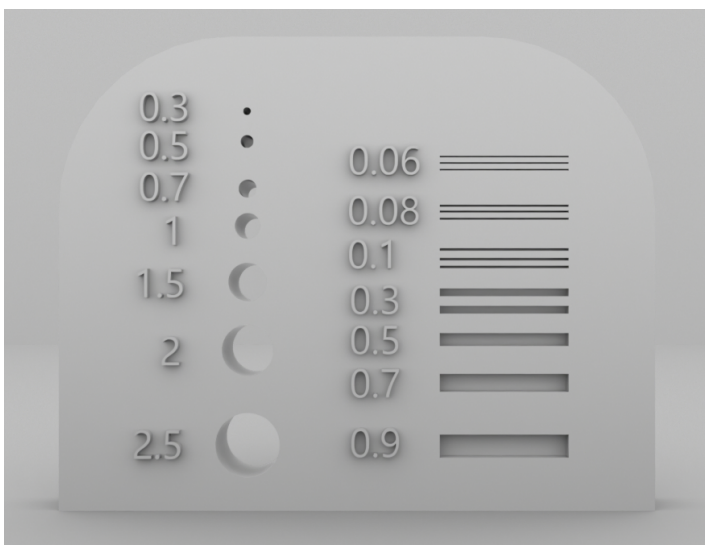


## Minimum Hole Diameter and Engraved Detail Width, Z-axis, at 0.05mm Layer Height

This indicator shows the minimum hole diameter and engraving groove width that can be successfully printed on the Z axis with a layer thickness of 0.05mm.

*Recommended diameter:*  $\geq 1.5$  mm

*Recommended width:*  $\geq 0.06$  mm





## Section 4

# Applications

### Study Model

